



TENNESSEE DEPARTMENT OF

EDUCATION
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Collision Repair: Non-Structural

Primary Career Cluster:	Transportation, Distribution, & Logistics
Consultant:	Rachel Allen, (615) 532-2835, Rachel.Allen@tn.gov
Course Code(s):	6062
Prerequisite(s):	<i>Introduction to Collision Repair</i> (6172)
Credit:	1 – 3 (See Recommended Credit below)
Grade Level:	10 – 12
Graduation Requirements:	This course satisfies up to three credits of three credits required for an elective focus when taken in conjunction with other Transportation, Distribution, & Logistics courses.
Programs of Study and Sequence:	This course may be used as the second, third, or fourth course in the <i>Automotive Collision Repair</i> program of study.
Necessary Equipment:	Please visit http://www.natef.org for necessary equipment list.
Aligned Student Organization(s):	SkillsUSA: http://www.tnskillsusa.org Brandon Hudson, (615) 532-2804, Brandon.Hudson@tn.gov
Coordinating Work-Based Learning:	Teachers are encouraged to use embedded WBL activities such as informational interviewing, job shadowing, and career mentoring. For information, visit http://tn.gov/education/cte/work_based_learning.shtml .
Available Student Industry Certifications:	Automotive Service Excellence (ASE) Student Certification or Professional Certification, or I-CAR Non-Structural Technician ProLevel 1
Dual Credit or Dual Enrollment Opportunities:	Students who obtain the ASE student certification may be able to articulate hours at Tennessee Colleges of Applied Technology.
Teacher Endorsement(s):	507, 771
Required Teacher Certifications/Training:	ASE B-3 or ASE B-4 or I-CAR Industry Certification
Teacher Resources:	http://www.tn.gov/education/cte/TransportationDistributionLogistics.shtml

Course Description

Collision Repair: Non-Structural is for students who wish to obtain in-depth knowledge and skills in repair procedures for non-structural repairs in preparation for postsecondary training and careers as collision repair technicians. Upon completion of this course, proficient students will be able to analyze

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non-structural collision damage and write and revise repair plans. Students will read and interpret technical texts to determine, understand, and safely perform appropriate repair techniques and procedures. Standards in this course include preparing vehicles for repair, removing and replacing panels and body components, metal finishing, body filling, removing and replacing moveable glass and hardware, metal welding and cutting, and repair of plastics. Standards in this course are aligned with Tennessee State Standards for English Language Arts & Literacy in Technical Subjects, Tennessee State Standards in Mathematics, and to the National Automotive Technicians Education Foundation (NATEF) standards, a national framework of industry-benchmarked standards.* Students completing the Collision Repair program of study will be eligible to take the examination for Automotive Student Excellence (ASE) Student Certification in Collision Repair. Students completing this course will be eligible to take the examination for ASE Professional Certification in Non-Structural Analysis and Damage Repair (B3). Some tasks are assigned a "High Priority (HP)" designation. NATEF accredited programs must include at least 95% of the HP-I (Individual) tasks and 90% of the HP-G (Group) tasks in the curriculum.

Program of Study Application

This course may be used as the second, third, or fourth course in the *Automotive Collision Repair* program of study, based on the focus of the program and number of credits to be offered. For more information on the benefits and requirements of implementing this program in full, please visit the Transportation, Distribution, & Logistics website at <http://www.tn.gov/education/cte/TransportationDistributionLogistics.shtml>.

Recommended Credits

If all standards in the course are covered, the course is recommended for three credits. If one or two credits are offered the following options are recommended.

1 Credit Option

Content	Standards
Safety	1- all
Preparation	2- all 3- e, f, g
Outer Body Panel Repairs, Replacements, and Adjustments	4- all 5- b
Metal Welding and Cutting	9- f, g, h, 10- a 11- a, b 12- b, c 13- b
Plastics and Adhesives	14- a, b

2 Credit Option

Content	Standards
Safety	1- all
Preparation	2- all 3- all
Outer Body Panel Repairs, Replacements, and Adjustments	4- all 5- all 6- c, g
Metal Finishing and Body Filling	7- a, b, c, f, g, h, i, j
Moveable Glass and Hardware	8- b
Metal Welding and Cutting	9- all 10- all 11- a, b 12- all 13- all
Plastics and Adhesives	14- all

Course Standards

Safety

For every task in *Collision Repair: Non-Structural*, the following safety requirement must be strictly enforced:

- 1) Comply with personal and environmental safety practices associated with clothing and the use of gloves; respiratory protection; eye protection; hearing protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations. Identify vehicle manufacturer's SRS types, locations, and recommended procedures before inspecting or replacing components. (TN Reading 3, 4)
 - a. Use and inspect personal protective equipment every time equipment is used
 - b. Inspect, maintain, and employ safe operating procedures with tools and equipment, such as hand and power tools, ladders, scaffolding, and lifting equipment
 - c. Assume responsibilities under HazCom (Hazard Communication) regulations
 - d. Adhere to responsibilities, regulations, and Occupational Safety & Health Administration (OSHA) policies regarding reporting of accidents and observed hazards, and regarding emergency response procedures
 - e. Maintain a portfolio record of written safety examinations and equipment examination for which the student has passed an operational checkout by the instructor
 - f. Utilize MSDSs (material safety data sheets), and identify the health hazards associated with hazardous material

Preparation

- 2) Read and interpret a damage report and observe damages, synthesizing information from both text and observation to create a basic repair plan for a damaged automobile. Citing resources such as instructional manuals, textbooks, example work orders, and other resources, create a written overview of the steps necessary to repair the vehicle. (TN Reading 1, 2, 3, 4, 6, 9; TN Writing 2, 4, 9)
 - a. Review damage report and analyze damage to determine appropriate methods for overall repair; develop and document a repair plan. HP-I
- 3) Describe and demonstrate the steps necessary to prepare an automobile for non-structural repair. Synthesize information gathered from textbooks, online resources, and firsthand experiences observing a qualified technician to create a list of tools, equipment, and materials needed for each step of preparation. Write a description of the responsibilities and procedures of the repair technician, emphasizing safety procedures in each of the following. (TN Reading 2, 3, 4, 5, 6, 9; TN Writing 2, 4, 9)
 - a. Inspect, remove, label, store, and reinstall exterior trim and moldings. HP-I
 - b. Inspect, remove, label, store, and reinstall interior trim and components. HP-I
 - c. Inspect, remove, label, store, and reinstall body panels and components that may interfere with or be damaged during repair. HP-I
 - d. Inspect, remove, label, store, and reinstall vehicle mechanical and electrical components that may interfere with or be damaged during repair. HP-G

- e. Protect panels, glass, interior parts, and other vehicles adjacent to the repair area. HP-I
- f. Soap and water wash entire vehicle; complete pre-repair inspection checklist. HP-I
- g. Prepare damaged area using water-based and solvent-based cleaners. HP-I
- h. Remove corrosion protection, undercoatings, sealers, and other protective coatings as necessary to perform repairs.
- i. Inspect, remove, and reinstall repairable plastics and other components for off-vehicle repair. HP-I

Outer Body Panel Repairs, Replacements, and Adjustments

- 4) Read and interpret technical information regarding direct and indirect/hidden damage and direction of impact. Examine case studies to create a library of various damages incurred on a range of vehicle types. Hypothesize the direction of impact of each, citing evidence to justify claims. Use the information to investigate and report on the damage incurred in outer body panels of given vehicles. Drawing on research and feedback from instructors and peers, review, edit, and revise repair plans generated in standard 2, using technology where appropriate. (TN Reading 1, 2, 3, 4, 5; TN Writing 2, 4, 5, 6, 7, 9)
 - a. Determine the extent of direct and indirect/hidden damage and direction of impact; develop and document a repair plan. HP-I
- 5) Distinguish among the various panels and components of a vehicle's outer body. Compare and contrast the tools, equipment, and procedures for inspecting, removing, replacing, and aligning each of the following. Summarize the key considerations and procedures an automotive technician should discern when performing the following processes in a written, oral, or visual presentation, citing evidence from resources such as instructional videos, manuals, tutorials, and other resources. Demonstrate the proper steps in inspecting the components of a vehicle's outer body. (TN Reading 1, 2, 3, 4, 5, 8, 9; TN Writing 2, 4, 9)
 - a. Inspect, remove and replace bolted, bonded, and welded steel panel or panel assemblies. HP-G
 - b. Determine the extent of damage to aluminum body panels; repair or replace. HP-G
 - c. Inspect, remove, replace, and align hood, hood hinges, and hood latch. HP-I
 - d. Inspect, remove, replace, and align deck lid, lid hinges, and lid latch. HP-I
 - e. Inspect, remove, replace, and align doors, latches, hinges, and related hardware. HP-I
 - f. Inspect, remove, replace and align tailgates, hatches, liftgates, and sliding doors. HP-G
 - g. Inspect, remove, replace, and align bumper bars, covers, reinforcement, guards, isolators, and mounting hardware. HP-I
 - h. Inspect, remove, replace and align fenders, and related panels. HP-I
- 6) Use the proper tools and procedures to repair outer body panels. (TN Reading 3, 4)
 - a. Straighten contours of damaged panels to a suitable condition for body filling or metal finishing using power tools, hand tools, and weld-on pulling attachments. HP-I
 - b. Weld damaged or torn steel body panels; repair broken welds. HP-G
 - c. Restore corrosion protection. HP-I
 - d. Replace door skins. HP-G
 - e. Restore sound deadeners and foam materials. HP-G
 - f. Perform panel bonding and weld bonding. HP-G
 - g. Diagnose and repair water leaks, dust leaks, and wind noise. HP-G
 - h. Identify one-time use fasteners. HP-G

Metal Finishing and Body Filling

- 7) Examine the processes, tools, and materials involved in applying body filling and finishing metal. Read and interpret instructions to prepare materials such as mixing instructions for body filler. Consult a range of resources which outline minor body repair processes for a variety of damage types. Assess the authors' claims and determine the usefulness of each source. Appropriately use the research to recommend and complete the proper repair procedures for given body panel damages. (TN Reading 1, 2, 3, 4, 6, 8, 9; TN Writing 1, 4, 8, 9)
- a. Remove paint from the damaged area of a body panel. HP-I
 - b. Locate and repair surface irregularities on a damaged body panel. HP-I
 - c. Demonstrate hammer and dolly techniques. HP-I
 - d. Heat shrink stretched panel areas to proper contour. HP-I
 - e. Cold shrink stretched panel areas to proper contour. HP-I
 - f. Prepare and apply body filler. HP-I
 - g. Identify different types of body fillers. HP-G
 - h. Rough sand body filler to contour; finish sand. HP-I
 - i. Determine the proper metal finishing techniques for aluminum. HP-G
 - j. Determine proper application of body filler to aluminum. HP-G

Moveable Glass and Hardware

- 8) Read and interpret technical information to define the structure, purpose, and function of moveable glass and hardware system components and demonstrate appropriate repairs of each. Create a written, oral, or visual presentation describing the proper procedures for each of the following, drawing on information from textbooks, OEM manuals, diagrams, demonstrations, and other instructional narratives. (TN Reading 1, 2, 3, 4, 7, 9; TN Writing 2, 4, 9)
- a. Inspect, adjust, repair or replace window regulators, run channels, glass, power mechanisms, and related controls. HP-I
 - b. Inspect, adjust, repair, remove, reinstall or replace weather-stripping. HP-G
 - c. Inspect, repair or replace, and adjust removable power operated roof panel and hinges, latches, guides, handles, retainer, and controls of sunroofs. HP-G
 - d. Inspect, remove, reinstall, and align convertible top and related mechanisms. HP-G
 - e. Initialize electrical components as needed. HP-G

Metal Welding and Cutting

- 9) Compare and contrast the different tools, procedures, and welding methods used to weld and cut aluminum, high-strength steels, and other steels, noting when substrates are weldable. Create a chart or other visual display describing the tools, tool settings, procedures, and methods for welding in a variety of situations. Perform basic welding and cutting of aluminum and steel.
- a. Identify weldable and non-weldable substrates used in vehicle construction. HP-I
 - b. Weld and cut high-strength steel and other steels. HP-I
 - c. Weld and cut aluminum. HP-G
 - d. Determine the correct GMAW (MIG) welder type, electrode/wire type, diameter, and gas to be used in a specific welding situation. HP-I

- e. Set up and adjust the GMAW (MIG) welder to "tune" for proper electrode stickout, voltage, polarity, flow rate, and wire-feed speed required for the substrate being welded. HP-I
 - f. Store, handle, and install high-pressure gas cylinders. HP-I
 - g. Determine work clamp (ground) location and attach. HP-I
 - h. Use the proper angle of the gun to the joint and direction of gun travel for the type of weld being made in the flat, horizontal, vertical, and overhead positions. HP-I
- 10) Describe and demonstrate strategies used to prepare vehicle body components for welding. Write persuasively to describe the key procedures, justifying the need for each by citing information gathered from textbooks, online resources, and other resources. (TN Reading 1, 2, 3, 4; TN Writing 1, 4, 9)
- a. Protect adjacent panels, glass, vehicle interior, etc. from welding and cutting operations. HP-I
 - b. Protect computers and other electronic control modules during welding procedures. HP-I
 - c. Clean and prepare the metal to be welded, assure good metal fit-up, apply weld through primer if necessary, clamp or tack as required. HP-I
- 11) Distinguish among the various types of weld and joint type. Emphasizing proper safety equipment and techniques, implement the appropriate tools, equipment, techniques, and procedures to perform a variety of welds. (TN Reading 2, 3, 4)
- a. Determine the joint type (butt weld with backing, lap, etc.) for weld being made. HP-I
 - b. Determine the type of weld (continuous, stitch weld, plug, etc.) for each specific welding operation. HP-I
 - c. Perform the following welds: continuous, plug, butt weld with and without backing, fillet, etc. HP-I
- 12) Identify and demonstrate basic inspection and troubleshooting strategies appropriate for evaluating welds. Use the knowledge to remedy the problem. (TN Reading 3)
- a. Perform visual and destructive tests on each weld type. HP-I
 - b. Identify the causes of various welding defects; make necessary adjustments. HP-I
 - c. Identify cause of contact tip burn-back and failure of wire to feed; make necessary adjustments. HP-I
- 13) Research, explore, and perform a range of procedures used to cut and attach non-structural components, noting when each method is commonly used based on information gathered from textbooks and online resources. (TN Reading 1, 2, 3, 4; TN Writing 2, 9)
- a. Identify cutting process for different substrates and locations; perform cutting operation. HP-I
 - b. Identify different methods of attaching non-structural components (squeeze type resistant spot welds (STRSW), riveting, non-structural adhesive, silicon bronze, etc.). HP-G

Plastics and Adhesives

- 14) Given damaged plastic components, use resources such as textbooks, OEM manuals, diagrams, and material instructions to identify the nature of the problem and complete appropriate repair. Develop a graphic illustration to identify and describe the types of plastic repair procedures, emphasizing the conditions which require each type of procedure. Select the appropriate repair

procedures and justify the selection with evidence drawn from the resources listed above. (TN Reading 1, 3, 4, 7; TN Writing 1, 4)

- a. Identify the types of plastics; determine repairability. HP-I
- b. Clean and prepare the surface of plastic parts; identify the types of plastic repair procedures. HP-I
- c. Repair rigid, semi-rigid, or flexible plastic panels. HP-I
- d. Remove or repair damaged areas from rigid exterior composite panels. HP-G
- e. Replace bonded rigid exterior composite body panels; straighten or align panel supports. HP-G

Standards Alignment Notes

*References to other standards include:

- TN Reading: [Tennessee State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects](#); Reading Standards for Literacy in Science and Technical Subjects 6-12; Grades 9-10 Students (page 62).
 - Note: While not directly aligned to one specific standard, students who are engaging in activities outlined above should be able to also demonstrate fluency in Standard 10 at the conclusion of the course.
- TN Writing: [Tennessee State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects](#); Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects 6-12; Grades 9-10 Students (pages 64-66).
 - Note: While not directly aligned to one specific standard, students who are engaging in activities outlined above should be able to also demonstrate fluency in Standards 3 and 10 at the conclusion of the course.
- TN Math: [Tennessee State Standards for Mathematics](#); Math Standards for High School: Number and Quantity, Geometry, and Statistics.
 - Note: The standards in this course are not meant to teach mathematical concepts. However, the concepts referenced above may provide teachers with opportunities to collaborate with mathematics educators to design project based activities or collaborate on lesson planning. Students who are engaging in activities listed above should be able to demonstrate quantitative, geometric, and statistical reasoning as applied to specific technical concepts. In addition, students will have the opportunity to practice the habits of mind as described in the eight Standards for Mathematical Practice.
- National Automotive Technicians Education Foundation (NATEF) standards for [Non-Structural Analysis and Damage Repair](#) (pages 62 – 65).
- P21: Partnership for 21st Century Skills [Framework for 21st Century Learning](#)
 - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.